

Nonstress Testing in a Physician's Office— A Five-Year Experience

WASHINGTON C. HILL, MD; MARY ALDERSON, RN, MA,
and TAHIRA HENDERSON, RN, MNP, Sacramento, California

A study was undertaken to evaluate the use of nonstress testing in a physician's office in the management of high-risk pregnancies. A total of 1,485 office nonstress tests were done on 713 high-risk patients between 32 and 43 weeks' gestation. When indicated the contraction stress test was done in hospital. In all, 485 patients had a nonstress test within a week of their delivery, 97% of which were reactive and 2% were nonreactive. Those fetuses with a nonreactive test result had a significantly increased incidence of abnormal fetal heart rate patterns during labor and intrapartum fetal distress leading to cesarean delivery. With strict adherence to a protocol, nonstress testing in the physician's office can be successful in caring for fetuses thought to be at risk.

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Obstetricians are constantly searching for additional methods of antepartum fetal surveillance to evaluate normal and high-risk pregnancies. The tests of antepartum fetal heart rate monitoring are the contraction stress test and the nonstress test. The nonstress test has certain advantages over the contraction stress test in that it requires less time to do, is simpler to interpret and has no contraindications. Various authors have shown that when the nonstress test is done in hospital, it can identify and evaluate a high-risk fetus.^{1,2} Out-patient nonstress testing has been investigated by several authors who concluded that it is appropriate for office use.^{3,4} Office antepartum fetal heart rate monitoring has increased since it was first introduced in the mid-1970s. There are few reports on the use of the nonstress test in office practice.⁴

We undertook a prospective study in a private practice for five years to evaluate the use of office nonstress testing in managing high-risk pregnancies. The purpose of the study was to test the hypothesis that by strictly adhering to a protocol, the nonstress test can be successful in physicians' offices in monitoring and identifying compromised fetuses. Herein we report our clinical experience with office antepartum fetal heart rate monitoring.

Patients and Methods

A total of 713 high-risk mothers in the private practice of one of us (W.C.H.) underwent 1,485 office nonstress tests for the indications given in Table 1. A number of patients had more than one indication, the most frequent of which was

postdate pregnancy. All tests were carried out in an examination room of the office as part of the regular pregnancy evaluation. Only nonstress tests were done. When contraction stress tests were indicated, they were done in hospital. Two nurses and an electrocardiographic technician trained in antepartum fetal heart rate testing did all the nonstress testing. A Corometrics 111A fetal heart rate monitor was used. A tocodynamometer was used to record fetal movement and uterine activity. The fetal heart rate was recorded using the fetal electrocardiogram, ultrasonogram or phonocardiogram.

The tests were done and interpreted with strict adherence to the method and criteria previously described by other investigators.⁴⁻⁶ When spontaneous fetal activity was not observed or was insufficient, abdominal palpation was used to stimulate the fetus and induce fetal movement. A reactive nonstress test was defined as at least two accelerations of the fetal heart rate during a 10-minute period of at least 15 beats per minute lasting for 15 seconds and repeated within a week in the physician's office. At the end of 40 minutes of observation, if accelerations were insufficient to meet this definition after palpation, the test was considered nonreactive. Those tests that remained sinusoidal or nonreactive for 40 minutes were repeated within 24 hours in the office following a meal. If still nonreactive, the test was followed the same day with a contraction stress test. The average time for doing the nonstress test was 19 ± 5 minutes (mean \pm standard deviation). Estriols were not used in the study group.

In all, 485 fetuses were grouped according to their last

From the Perinatal Center, Sutter Memorial Hospital, Sacramento, California.

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Reprint requests to Washington C. Hill, MD, Maternal-Fetal Medicine, The Perinatal Center, Sutter Memorial Hospital, 5275 F Street, Sacramento, CA 95819.

reactive or nonreactive nonstress test results seven or fewer days before delivery. Intrapartum complications and neonatal outcome in the reactive and nonreactive groups were compared to determine whether these responses accurately identified high-risk fetuses. Perinatal morbidity was defined as a hospital stay longer than five days in the nursery for medical indications. Repetitive, severe, variable or late decelerations during the first stage of labor were considered abnormal fetal heart rate patterns during labor. Intrapartum fetal distress was defined as persistent abnormal fetal heart rate patterns during labor. Statistical comparison of the reactive and nonreactive groups was done using the χ^2 test for unequal expected frequencies.

Results

During the five-year study period, 1,485 nonstress tests were done on 713 high-risk mothers in the physician's office. Distribution of the fetal heart rate patterns during the tests is shown in Table 2. Nonreactive, equivocal and unsatisfactory test results were most common during the first year of the study. Of the 485 fetuses who were delivered within seven days of their last nonstress test, the test results of 469 (97%) were reactive, 10 (2%) were nonreactive and 6 (1%) were equivocal, sinusoidal or unsatisfactory. The perinatal outcome for the nonreactive group was less favorable than for the reactive group, with a significant increase in abnormal fetal heart rate patterns during labor and cesarean sections for intrapartum fetal distress (Table 3). There were no stillbirths of any of the fetuses tested. Two infants died after birth of congenital anomalies.

Thirty nonstress tests remained nonreactive and required a contraction stress test. The latter was not done following ten of these tests, however, due to contraindications or patient refusal. A reactive nonstress test result occurred in six mothers being prepared for their contraction stress testing and no further testing was done. A spontaneous contraction stress test occurred during four nonreactive nonstress tests, the results of three of which were normal and one was abnormal. Ten contraction stress tests were completed in the remaining women with nonreactive nonstress tests as shown in Table 4.

Labor was induced in three mothers who had a positive contraction stress test result. In one of these patients at 43 weeks' gestation, because of meconium-stained amniotic fluid and late decelerations during labor, a cesarean section was done and a male infant with Apgar scores of 5 and 7 at one and five minutes, respectively, was delivered. The second patient at 40 weeks' gestation was suspected of having intrauterine growth retardation. No decelerations occurred during labor and a small-for-gestational-age male infant weighing 2,800 grams with Apgar scores of 6 and 8 was delivered vaginally. The third patient had a spontaneous positive contraction stress test result at 43 weeks' gestation. There was meconium-stained amniotic fluid and variable decelerations during labor. A low forceps delivery for fetal distress was carried out and a female infant with Apgar scores of 5 and 6 was delivered.

Discussion

This report emphasizes the applicability of doing nonstress testing in a physician's office. Nonstress testing done in this manner is accurate. The distribution of fetal heart rate

TABLE 1.—Indications for the Office Nonstress Test in 713 Patients

Indications	Number	(%)
Postdate pregnancy*	335	(42.4)
Suspected growth retardation†	142	(18.0)
Decreased fetal movement‡	130	(16.4)
Preeclampsia	49	(6.2)
Diabetes (all classes)	16	(2.0)
Chronic hypertension	15	(1.9)
Previous stillbirth	11	(1.4)
Miscellaneous	93	(11.8)
Total	791§	

*Pregnancy exceeded 42 weeks.

†Size less than dates by physical examination, ultrasonogram or both.

‡Patient perceived less than usual fetal movement following meals or during the day.

§Some patients had more than one indication.

TABLE 2.—Distribution of Fetal Heart Rate Patterns During Office Nonstress Testing in 713 Patients

Heart Rate Patterns	Tests Number	(%)
Total tests	1,485	
Reactive	1,396	(94.0)
Nonreactive	30	(2.0)
Equivocal	45	(3.0)
Sinusoidal	1	(0.1)
Unsatisfactory	13	(0.9)

TABLE 3.—Intrapartum Complications and Perinatal Outcome of the Fetuses With Reactive and Nonreactive Test Results*

Complications	Reactive (N = 496) 97%	Nonreactive† (N = 10) 2%
Neonatal deaths	2 (0.4)‡	0
Perinatal morbidity	32 (6.5)	2 (20)
Abnormal fetal heart rate pattern during labor	18 (3.6)	5 (50)§
Cesarean section for intrapartum fetal distress	4 (0.8)	2 (20)§
Apgar score less than 7 at 1 minute	37 (7.5)	1 (10)
Apgar score less than 7 at 5 minutes	14 (2.8)	1 (10)
Meconium-stained fluid	46 (9.3)	2 (20)

*The last nonstress test was within 7 days of delivery.

†Some infants had more than one complication.

‡The two infants who died had Potter's syndrome.

§Significantly different from the reactive value, $P < .001$.

TABLE 4.—Persistent Nonreactive Nonstress Test Results

Test Results	Number	(%)
Contraction stress test not done	10	(33.3)
Reactivity spontaneously observed	6	(20.0)
Contraction stress test results		
Spontaneous		
Negative	3	(10.0)
Positive	1	(3.3)
Oxytocin-induced		
Negative	6	(20.0)
Equivocal	1	(3.3)
Positive	2	(6.7)
Unsatisfactory	1	(3.3)
Total	30	

responses in Table 2 is what would be expected in a high-risk obstetric practice. Trained personnel in the physician's office can correctly carry out and interpret the nonstress test, but all tests must be reviewed by the physician. The results of office testing are consistent with reports from centers doing hospital-based nonstress tests.⁷ Nochimson and co-workers doing the test in two medical centers reported similar results.⁸ Using the nonstress test, they were also able to identify high-risk fetuses. Keegan and associates showed that the nonstress test was a practical and accurate outpatient test when used in screening high-risk patients.³ They suggested the outpatient hospital approach was appropriate for nonstress testing in a physician's office. Our results confirm and expand their findings.

By strictly adhering to a protocol, the nonstress test done in a physician's office can successfully monitor a high-risk fetus and detect an infant who can have an abnormal fetal heart rate pattern during labor. The data in Table 4 show that a nonreactive fetus was identified. The group of fetuses represented in Table 4 had a higher incidence of abnormal fetal heart rate patterns during labor and of cesarean sections for

fetal distress. Strict adherence to a protocol is necessary because it will decrease the possibility of misinterpreting or not appropriately following up the test result. Figure 1 provides a protocol for the use of the nonstress test in physicians' offices and shows how it and the contraction stress test can be used together in a complementary manner.⁹

There are several advantages to using this approach to nonstress testing. The nonstress test done in a physician's office is practical and more convenient for patients than hospital testing because it can be done at the time of the patient's regular appointment. Data from our 1984 survey of physicians doing these tests in their offices show that office nonstress testing is less expensive (\$40) than testing done in hospital (\$80). The appropriate use of office nonstress testing can decrease the need for hospital-based testing and, in some institutions, overburdening labor and delivery units.

Practical considerations of office nonstress testing include selecting the equipment and reimbursement. Numerous fetal heart rate monitors from at least six companies are now available for private practitioners contemplating office monitoring. Each has certain advantages and disadvantages that should be considered when purchasing a monitor for office use. When selecting an office monitor, some of the features that should be carefully evaluated are cost, method used to process the signal, the printer, paper speed, technique for recording the fetal heart rate and contractions and size of the monitor. Third-party carriers (Medicaid, Blue Cross) reimburse physicians different amounts for doing the office nonstress test but only for specific indications as in Table 1. The average amount reimbursed is \$40 (range \$33 to \$47) based on our recent survey.

In summary, antepartum fetal heart rate monitoring has become a useful office procedure for efficient fetal surveillance by private practitioners.

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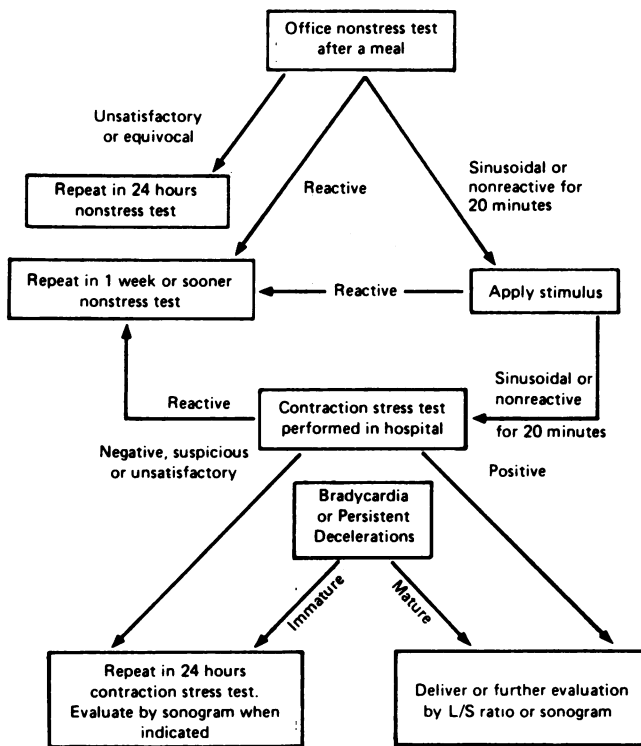


Figure 1.—A protocol for nonstress testing in a physician's office. L/S = lecithin-sphingomyelin